Complete Summary

GUIDELINE TITLE

Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI).

BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [Internet]. Helsinki, Finland: Wiley Interscience. John Wiley & Sons; 2008 Apr 11 [Various]. [7 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [Internet]. Helsinki, Finland: Wiley Interscience. John Wiley & Sons; 2006 Apr 28 [various].

** REGULATORY ALERT **

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- February 28, 2008, Heparin Sodium Injection: The U.S. Food and Drug Administration (FDA) informed the public that Baxter Healthcare Corporation has voluntarily recalled all of their multi-dose and single-use vials of heparin sodium for injection and their heparin lock flush solutions. Alternate heparin manufacturers are expected to be able to increase heparin production sufficiently to supply the U.S. market. There have been reports of serious adverse events including allergic or hypersensitivity-type reactions, with symptoms of oral swelling, nausea, vomiting, sweating, shortness of breath, and cases of severe hypotension.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Acute ST elevation myocardial infarction (STEMI)

GUIDELINE CATEGORY

Evaluation
Management
Prevention
Treatment

CLINICAL SPECIALTY

Cardiology
Critical Care
Emergency Medicine
Internal Medicine

INTENDED USERS

Emergency Medical Technicians/Paramedics
Health Care Providers
Physicians

GUIDELINE OBJECTIVE(S)

Evidence-Based Medicine Guidelines collect, summarize, and update the core clinical knowledge essential in general practice. The guidelines also describe the scientific evidence underlying the given recommendations.

TARGET POPULATION

Patients with imminent or known acute ST elevation myocardial infarction (STEMI)

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation/Management/Treatment

Procedure Prior to Treatment

1. Evaluating appropriateness of administering thrombolytic therapy (clinical picture, pain, electrocardiogram [ECG] results, no contraindications)
2. Continuous ECG monitoring, readiness to defibrillate.
3. Glyceryl trinitrate and oxygen
4. Aspirin
5. Intravenous cannulas with sodium chloride (NaCl) infusion
6. Blood samples (hemoglobin, leukocytes, sodium, potassium, creatinine, troponin)
7. Beta-blocker
8. Clopidogrel
9. Nitrate infusion if indicated

Thrombolytic Treatment

1. Thrombolysis with streptokinase or a tissue plasminogen activator (tPA) (tenecteplase, reteplase, or alteplase)
2. Heparin with tPA thrombolysis

Other Management/Treatments

1. Transfer to hospital
2. Prevention and treatment of bleeding complications
3. Assessment of coronary artery patency
4. Percutaneous transluminal coronary angioplasty (PTCA)

MAJOR OUTCOMES CONSIDERED

- Rates of acute ST-segment elevation myocardial infarction
- Treatment outcomes
    - Coronary artery patency
    - Mortality rates
    - Complication rates

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The evidence reviewed was collected from the Cochrane database of systematic reviews and the Database of Abstracts of Reviews of Effectiveness (DARE). In addition, the Cochrane Library and medical journals were searched specifically for original publications.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Classification of the Quality of Evidence

Code	Quality of Evidence	Definition
A	**High**	Further research is very unlikely to change our confidence in the estimate of effect. • Several high-quality studies with consistent results • In special cases: one large, high-quality multi-centre trial
B	**Moderate**	Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate. • One high-quality study • Several studies with some limitations
C	**Low**	Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate. • One or more studies with severe limitations
D	**Very Low**	Any estimate of effect is very uncertain. • Expert opinion • No direct research evidence • One or more studies with very severe limitations

GRADE (Grading of Recommendations Assessment, Development and Evaluation) Working Group 2007 (modified by the EBM Guidelines Editorial Team).

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The levels of evidence [A-D] supporting the recommendations are defined at the end of the "Major Recommendations" field.

Basic Rules

- Primary balloon angioplasty (primary cutaneous coronary intervention [PPCI]) provides superior results compared to thrombolytic therapy and should therefore always be prioritized.
- The earlier the thrombolytic therapy is started, the better the chances of achieving reperfusion. Time is more crucial than the agent used. "One hundred minutes from the onset of pain" (Boersma et al., 1996) [**B**].
- All patients fulfilling the criteria should be offered immediate reperfusion. Delays must be prevented at all treatment phases. Treating an imminent major acute myocardial infarction (MI) with immediate reperfusion is as urgent as the treatment of multiple trauma!
- Pharmacological reperfusion therapy consists of the administration of a fibrinolytic and antithrombotic agent.
- If pharmacological reperfusion therapy is contraindicated, or has failed, an attempt should be made to recanalize the artery with balloon angioplasty
- Electrocardiogram (ECG) recordings of a patient with acute ischaemic chest pain must be repeated (in 30 minutes) if the first recording is non-diagnostic.

Indications for Thrombolytic Therapy

- All the criteria 1 to 4 must be met.
    1. Clinical picture of imminent MI (note that the main symptom instead of pain is sometimes dyspnoea and acute left ventricular failure).
    2. Pain lasting more than 20 minutes but less than 3 hours. Treatment might be indicated even if the symptoms have lasted for longer, especially if the pain and ST segment elevation persist. Treatment outcome worsens sharply when treatment delay exceeds four hours, and thrombolytic treatment administered 12 hours after the onset of pain is rarely of any benefit. Consider primary balloon angioplasty (PPCI).
    3. ECG shows new signs of imminent myocardial damage:
        - $\geq$2 mm ST segment elevation at the J point in at least two chest leads or
        - $\geq$1 mm ST segment elevation in at least two limb leads or
        - New left bundle branch block (that prevents the evaluation of ECG) or
        - Reciprocal ST segment depression (V2-V3) due to posterior wall damage

    4. No contraindications

- If previous ECGs are available, check that the changes are new. Most interpretation errors occur with early repolarisation (ST segment elevations in chest leads V1-V4) and myocarditis (See Finnish Medical Society Duodecim guideline "Myocarditis.").
- A small Q wave does not prevent thrombolysis, although it indicates that myocardial damage has already occurred.
- Therapy is particularly important for patients with high ST segment elevations as a sign of extensive infarction and with no deep Q waves yet. If recanalization is not achieved with pharmacological reperfusion therapy, PPCI or at least rescue angioplasty should be performed in these patients.

Possible Indications

- There is no consensus on the reperfusion therapy of a true posterior wall infarction manifesting with reciprocal ST segment depression (V2 to V3) because anterior ischaemia may cause similar changes. If the clinical picture is suggestive of an acute MI, reperfusion should be considered. It is acceptable not to attempt reperfusion in a small inferior MI, particularly if the patient is at risk of bleeding. This should be considered especially in cases where the ST segment changes reverse quickly after the administration of nitrates, aspirin, and beta-blockers. A posterior infarction is often associated with a more extensive inferior-posterior infarction with accompanying inferior ST segment elevation (II, III, aVF) and possibly ST segment elevation in V4R suggestive of right ventricular involvement. If a posterior infarction is associated with a lateral infarction, ST segment elevation will be seen in the lateral leads (aVL, I, V6).
- If the ECG is distorted by a bundle branch block or paced ventricular rhythm, the need for reperfusion must be based on the clinical picture.

- Thrombolysis is not used in the treatment of non-ST elevation myocardial infarction nor in unstable angina, where the pain is caused by a partially occluded artery blocked by a platelet-rich clot originating from a plaque rupture. In these patients, the primary treatment consists of antiplatelet drugs (aspirin, clopidogrel, glycoprotein [GP] IIb/IIIa inhibitors) and LMW heparin. Rapid angioplasty is simultaneously pursued; see the Finnish Medical Society Duodecim guideline "Acute Coronary Syndromes: Unstable Angina Pectoris and Non-ST Segment Elevation Myocardial Infarction (NSTEMI)".

Contraindications

- If fibrinolytic therapy is contraindicated or has failed (Van de Werf et al., 2003), the patient must be referred urgently to a hospital where the occluded artery can be opened with angioplasty. Primary balloon angioplasty is in all situations better than fibrinolytic therapy whenever available.

Absolute Contraindications

- Strong suspicion of dissection of the aorta
- Pericardial tamponade
- Active gastrointestinal or other internal bleeding
- Brain tumour, arteriovenous malformation, or aneurysm
- Ischaemic stroke in preceding 6 months (a verified transient ischemic attack [TIA] is an exception)
- Previous intracerebral haemorrhage or subarachnoid haemorrhage
- Intracranial procedure or recent (<3 weeks) head trauma
- Severe known bleeding disorder: coagulation abnormality (haemophilia, von Willebrand disease), severe thrombocytopenia, etc.

Relative Contraindications

- Fibrinolytic treatment may come into question when applied with appropriate carefulness and consideration, if the onset of pain is within three hours, the imminent damage is extensive and balloon angioplasty is not available or feasible, even if the patient has relative contraindications. The relative contraindications include:
    - Recent intestinal bleeding, for example an ulcer
    - Recent surgery or significant trauma within preceding 2 to 4 weeks
        - At least 4 weeks safety period after (e.g., brain or eye surgery)
    - Hypertension (i.e. systolic over 180 to 200, diastolic over 100 to 110 mmHg)
    - Other life-threatening illness, for example, hepatic cirrhosis, severe renal insufficiency, metastatic cancer, etc.
    - Anticoagulant therapy increases the risk of intracerebral haemorrhage. If the patient is at risk of bleeding, vitamin K should be administered.
        - Patients on anticoagulant therapy require extra vigilance when possible fibrinolytic therapy is considered (balloon angioplasty is the primary choice). Administration of vitamin K is too late when a massive bleeding has already occurred.

- Other factors increasing the risk of bleeding should also be taken into account (e.g., anaemia, thrombocytopenia, renal insufficiency, advanced age, septic illness, prolonged resuscitation, operations).

Procedures Before Treatment

1. Continuous ECG monitoring, readiness to defibrillate.
2. Administer glyceryl trinitrate—two sublingual tablets or two doses of a spray—and oxygen: observe ST segment changes. (If the changes are reversible, reconsider the need for the thrombolytic treatment.)
3. Aspirin 250 milligrams orally (not if the patient is on warfarin or allergic to aspirin).
4. Insert two intravenous (i.v.) cannulas and start an infusion of sodium chloride (NaCl) (0.45% or 0.9%).
5. Take the following blood samples (preferably from the i.v. cannula before connecting the infusion): haemoglobin, leucocytes, sodium (Na), potassium (K), creatinine, troponin (do not wait for the results).
6. Beta-blocker (atenolol, metoprolol) may be given 5 mg i.v. over 5 minutes; repeat after 10 minutes if heart rate is over 50-60 beats/minute and there are no other contraindications (severe heart failure, asthma).
7. Clopidogrel (Chen et al, 2005; Sabatine et al., 2005) [**A**] is started with a 300 mg peroral loading dose and then 75 mg/day (not for patients over 75 years of age).
8. If blood pressure is high (>160/100), it should be reduced with a nitrate infusion.

Carrying Out Thrombolytic Treatment

- Thrombolysis is usually carried out using tissue plasminogen activator (tPA) (tenecteplase, reteplase, or alteplase), but streptokinase may also be used. The price difference is considerable but the effect on mortality is small. Streptokinase therapy is more difficult to carry out as it requires vigorous monitoring of blood pressure and continuous infusion. Heparin is not used together with streptokinase, but with tPA it is mandatory.
- Every effort must be made to minimize treatment delays whilst taking the contraindications into consideration.

Reteplase Regimen

- Give two bolus injections (10 + 10 U) of reteplase (Rapilysin®) at a 30-minute interval.
- Heparinization (Rubboli et al., 2007; Mahaffey et al., 1996; Antman et al., 2002) [**B**]
    - Low-molecular-weight (LMW) heparin, e.g., enoxaparin 30 mg bolus intravenously (not in association with streptokinase, not for patients over 75 years of age). After the fibrinolytic therapy, enoxaparin is continued with the dose of 1 mg/kg subcutaneously every 12 hours. The dose is decreased for patients over 75 years of age and in even a mild renal insufficiency.
- Clopidogrel, initial dose 300 mg orally (p.o.)

Tenecteplase Regimen

- Give tenecteplase (Metalyse®) according to body weight (30 to 50 mg for body weights 60 to 90 kg); the maximum dose is 10,000 units = 50 mg).
- Give as a single bolus over 10 seconds.
- Heparinization and clopidogrel as described above

Alteplase Regimen

1. Dilute the two 50 mg bottles of alteplase (Actilyse®).
2. Using a syringe, give an intravenous bolus of 15 mL (15 mg) over 1 to 2 minutes.
3. This is followed by intravenous infusion of:
    - 50 mg over the next 30 minutes
    - 35 mg over the next 60 minutes (Granger et al., 1994; Barbagelata et al., 1997) [**A**]
    - The total duration of the treatment is 90 minutes. An infusion pump must be used for the administration.
    - Heparinization (Rubboli et al., 2007; Mahaffey et al., 1996; Antman et al., 2002) [**B**] and clopidogrel as described above for reteplase treatment.

Streptokinase Regimen

- 1.5 million IU/30 to 60 min i.v.
- No heparinization, clopidogrel 300 mg p.o.

Transfer to Hospital

- If the patient's haemodynamic status is stable, he/she can be transported to a hospital during the administration of the thrombolytic therapy. A competent paramedic crew is sufficient if the patient's condition is stable; otherwise a doctor should accompany the patient.
- The patient should be monitored continuously and a defibrillator must be ready for use. Adrenaline (epinephrine), atropine, and lidocaine (for a bolus and infusion) must be readily available.
- A patient with an MI can be treated on a general ward, with adequate facilities, if invasive treatment is not an option due to severe concurrent diseases.

Prediction, Prevention, Monitoring, and Treatment Guidelines of Bleeding Complications

- Intracranial haemorrhage is a rare (1% to 2%) but the most serious complication of thrombolytic therapy. The risk increases if the contraindications are not observed. The incidence of intestinal and other haemorrhage is higher (5% to 10%) than that of intracranial haemorrhage, but they are treatable. Bleeding usually occurs 24 hours after the administration of the fibrinolytic agent.
- A bleed may be anticipated by monitoring the blood pressure, thrombocyte count, and haematocrit (e.g., every 6 hours during the first 24 hours after thrombolytic therapy). Vitamin K should be considered for patients who have previously received anticoagulants and are at risk of bleeding. Heparin dose is decreased in renal insufficiency.

- Signs of an intracranial haemorrhage include impaired level of consciousness or symptoms affecting one side only. A bleed is confirmed with a computed tomography (CT) scan. Treatment may include the involvement of a neurosurgeon in order to evacuate the haematoma. Internal bleeding will cause a decrease in blood pressure and haematocrit.
- Treatment of bleeding complications consists of the administration of blood cells (red cells, thrombocytes), fresh frozen plasma, and vitamin K.
    - Vitamin K 5 to 10 mg i.v. corrects clotting factors with a delay of 6 to 12 hours.
    - Frozen plasma will normalize international normalized ratio (INR) quickly.
        - Reversal of anticoagulation with frozen plasma requires large infusion volumes: reasonable only if there is a need for volume correction.
    - Protamine has only a weak effect on low-molecular-weight heparin and is not much used.
    - Tranexamic acid will only prevent fibrinolysis, which usually has already taken place at this stage. Tranexamic acid is thrombogenic and often only harmful when used in connection with bleeding complications.
    - The effect of aspirin on platelets will persist for 3 to 5 days.

Assessment of Coronary Artery Patency

- Intravenous administration of a fibrinolytic agent opens an occluded vessel in only half of the patients at best. The outcome is highly dependent on timing related factors.
- The opening of the vessel is suggested by
    - Improved chest pain
    - Rapid normalization of ST segments (halved within 90 minutes)
    - Reperfusion arrhythmias
    - Early but short lasting rise in serum markers (8 to 12 hours).

Primary Percutaneous Coronary Intervention (PPCI)

- Whenever possible primary angioplasty should always be considered instead of pharmacological reperfusion therapy (Grines et al., 2003; Duke & Molyneux, 2003; Asseburg et al., 2007) [**A**]; treatment outcome is better and the costs are lower (Keeley, Boura, & Grines, 2003).
    - Primary angioplasty has been shown in several studies to be more effective than pharmacological reperfusion therapy in the treatment of ST elevation myocardial infarction (STEMI) (Grines et al., 2003; Duke & Molyneux, 2003; Asseburg et al., 2007) [**A**]. Adequate flow rates are achieved in as many as 90% of cases.
    - The availability of angioplasty treatment and the provision of 24-hour cardiologist cover remain problems in many countries.
    - According to the Danish multicenter randomized study on fibrinolytic therapy versus acute coronary angioplasty in acute myocardial infarction (DANAMI-2) study, treatment outcome after angioplasty is superior to that achieved with thrombolysis provided that the angioplasty can be carried out within a 150 km radius. It is likely that

the use of angioplasty, therefore, as a treatment for acute STEMI will increase as the facilities of treating centres improve.

- Angioplasty is a superior treatment form if the time interval between the onset of pain and treatment is long.
- Primary angioplasty may also be considered if pharmacological reperfusion therapy is for some reason contraindicated, or it has failed. Reduction in the ST segment elevation by half in 90 minutes is a sign of successful fibrinolytic therapy.
- According to the current guidelines, primary angioplasty may be considered for high risk patients with:
    - Extensive infarction + contraindication to thrombolysis
    - Extensive anterior infarction
    - Inferior-posterior infarction with associated right ventricle infarction (see Table 1 in the original guideline document).
    - Acute pump failure
    - Cardiogenic shock
- If the patency of the artery was not achieved with pharmacological reperfusion therapy, a "rescue angioplasty" may be considered. The results of angioplasty carried out after pharmacological reperfusion therapy are not as good as those of primary angioplasty, but with modern interventions the procedure does, however, improve the patient's prognosis (Collet et al., 2006) [**B**].
- Platelet glycoprotein IIb/IIIa receptor antagonists are used to improve the prognosis in high-risk patients treated with angioplasty (Bosch & Marrugat, 2001; Vorchheimer, Badimon, & Fuster, 1999) [**A**].
- After implantation of a stent, the antithrombotic agent to be used is aspirin, which should be combined with clopidogrel for 3 to 6 months to prevent thrombosis and restenosis. With drug-eluting stents the combination therapy is continued up to 12 months. The epithelialization of drug-eluting stents is slow, and an uninterrupted aspirin-clopidogrel treatment is particularly important during the first few months after implantation (Iakovou et al., 2005)
    - Combination therapy increases the risk of bleeding in patients with a history of cerebral infarction.

Thrombolysis As First Aid

- The delay in treatment is shortened if the members of the emergency services start thrombolytic therapy. Motivated and trained personnel of an emergency service unit are able to interpret ECGs and make the diagnosis of an MI even better than an untrained doctor.
- Legal implications must be considered if a non-medical person initiates a potentially dangerous treatment. Therefore, the aim should be for a consulting physician to make the decision on initiating thrombolysis. Telemetry ECG makes such consultation possible.
- The hallmarks of the diagnosis are typical chest pain and ECG changes. Risk stratification should always be carefully carried out to avoid erroneous treatment decisions. The current contraindications are not difficult to comply with.
- An international recommendation has been issued for the administration of pre-hospital thrombolysis, which should be adjusted to local conditions. The American Heart Association (AHA) recommendation is available on the

Internet (www.americanheart.org) (Antman et al., 2004). Tenecteplase (single bolus) is the easiest to administer, while streptokinase is the most difficult.

Refer to the original guideline document for related evidence, including Cochrane reviews and other evidence summaries.

Definitions:

Classification of the Quality of Evidence

Code	Quality of Evidence	Definition
A	**High**	Further research is very unlikely to change our confidence in the estimate of effect. • Several high-quality studies with consistent results • In special cases: one large, high-quality multi-centre trial
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GRADE (Grading of Recommendations Assessment, Development and Evaluation) Working Group 2007 (modified by the EBM Guidelines Editorial Team).

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Concise summaries of scientific evidence attached to the individual guidelines are the unique feature of the Evidence-Based Medicine Guidelines. The evidence summaries allow the clinician to judge how well-founded the treatment recommendations are. The type of supporting evidence is identified and graded for select recommendations (see the "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate and timely reperfusion therapy in patients with acute ST elevation myocardial infarction (STEMI)

POTENTIAL HARMS

- Anticoagulant therapy increases the risk of intracerebral haemorrhage.
- Intracranial haemorrhage is a rare (1 to 2%) but the most serious complication of thrombolytic therapy. The risk increases if the contraindications are not observed. The incidence of intestinal and other haemorrhage is higher (5 to 10%) than that of intracranial haemorrhage, but they are treatable. Bleeding usually occurs 24 hours after the administration of the fibrinolytic agent.
- Combination therapy increases the risk of bleeding in patients with a history of cerebral infarction.
- Streptokinase therapy is more difficult to carry out as it requires vigorous monitoring of blood pressure and continuous infusion.

CONTRAINDICATIONS

CONTRAINDICATIONS

Contraindications to Thrombolytic Therapy

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    - Other life-threatening illness, for example hepatic cirrhosis, severe renal insufficiency, metastatic cancer, etc.
    - Anticoagulant therapy increases the risk of intracerebral haemorrhage. If the patient is at risk of bleeding, vitamin K should be administered.
        - Patients on anticoagulant therapy require extra vigilance when possible fibrinolytic therapy is considered (balloon angioplasty is the primary choice). Administration of vitamin K is too late when a massive bleeding has already occurred.
    - Other factors increasing the risk of bleeding should also be taken into account (e.g., anaemia, thrombocytopenia, renal insufficiency, advanced age, septic illness, cancer, prolonged resuscitation, operations).

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [Internet]. Helsinki, Finland: Wiley Interscience. John Wiley & Sons; 2008 Apr 11 [Various]. [7 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2004 Sep 14 (revised 2008 Apr 11)

GUIDELINE DEVELOPER(S)

Finnish Medical Society Duodecim - Professional Association

SOURCE(S) OF FUNDING

Finnish Medical Society Duodecim

GUIDELINE COMMITTEE

Editorial Team of EBM Guidelines

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Primary Author: Editors

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [Internet]. Helsinki, Finland: Wiley Interscience. John Wiley & Sons; 2006 Apr 28 [various].

GUIDELINE AVAILABILITY

This guideline is included in "EBM Guidelines. Evidence-Based Medicine" available from Duodecim Medical Publications, Ltd, PO Box 713, 00101 Helsinki, Finland; e-mail: info@ebm-guidelines.com; Web site: www.ebm-guidelines.com.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on August 31, 2005. This NGC summary was updated by ECRI on November 8, 2005, and again on August 7, 2006. This summary was updated by ECRI Institute on June 22, 2007 following the U.S. Food and Drug Administration (FDA) advisory on heparin sodium injection. This summary was updated by ECRI Institute on March 14, 2008 following the updated FDA advisory on heparin sodium injection. This NGC summary was updated by ECRI Institute on December 5, 2008.

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